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Solar and Geomagnetic Effects on the Concentration of ^{10}Be and ^{36}Cl in the GISP2 Ice Core

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^{10}Be and ^{36}Cl are produced in the atmosphere by the interaction of high energy cosmic ray primaries and secondaries with atmospheric gases. Both solar and terrestrial magnetic fields can influence the production rates of these radionuclides in the earth's atmosphere. Changes in atmospheric circulation and in snow accumulation rate can in turn affect the radionuclide concentration in polar ice samples. In order to study these effects, we measured a continuous profile of ^{10}Be and ^{36}Cl concentrations in the GISP2 ice core, which spans the time period from the present to beyond 100 kyr BP. ^{10}Be concentrations were on the order of a few times 10^4 at/g ice and ^{36}Cl concentrations about a factor of 5 less. We observed a large decrease in radionuclide concentration, about a factor of two, at the end of the Younger Dryas. Fluxes of ^{10}Be and ^{36}Cl calculated using the GISP2 accumulation rates, exhibited little or no change in concentration correlated with variations in the geomagnetic field such as are observed in the tree ring ^{14}C record. We do, however, detect fluctuations on a centennial time scale. These fluctuations are interpreted as resulting from variations in the solar magnetic field associated with quiet sun periods similar to the Maunder Minimum.

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